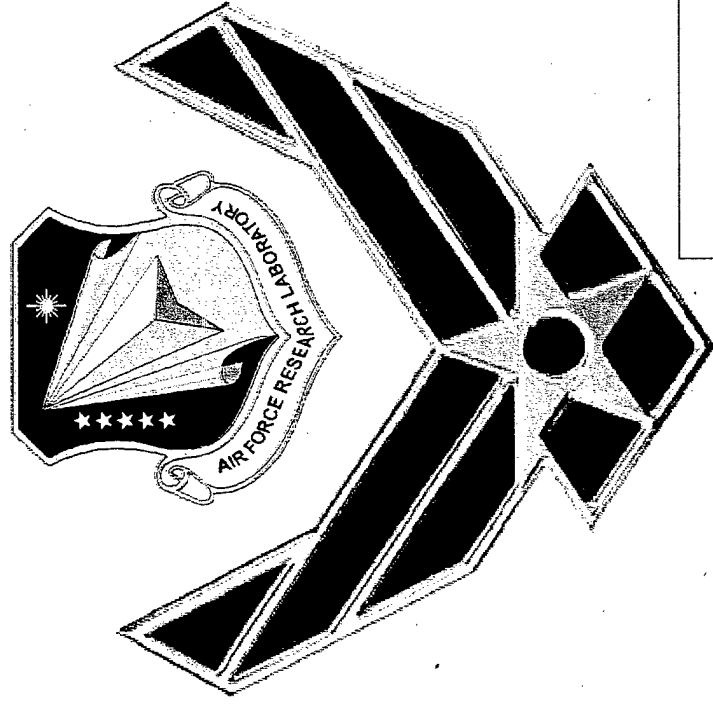


REPORT DOCUMENTATION PAGEForm Approved
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1. REPORT DATE (DD-MM-YYYY) 03-01-2004		2. REPORT TYPE Technical Paper (View Graph)		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE Monitoring Micro-Structural Evolution and Crack Formation in a Solid Propellant under Incremental Strain Condition – Using Digital Radiograph X-Ray Techniques				5a. CONTRACT NUMBER F04611-99-C-0025	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) C. T. Liu, Lee M. Klynn, Jay D. Thompson				5d. PROJECT NUMBER 2302	
				5e. TASK NUMBER 0378	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) ERC Incorporated 555 Sparkman Drive Huntsville, AL 35816-0000				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Research Laboratory (AFMC) AFRL/PRSB 4 Draco Drive Edwards AFB CA 93524-7160				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S NUMBER(S) AFRL-PR-ED-VG-2004-049	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution unlimited.					
13. SUPPLEMENTARY NOTES JANNAF Nondestructive Evaluation Subcommittee Meeting (NDES) New Orleans, LA, 29 Mar – 02 Apr 2004					
14. ABSTRACT					
<div>20040503 189</div>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT Unclassified			A	10	Linda Talon
b. ABSTRACT Unclassified					19b. TELEPHONE NUMBER (include area code) (661) 275-5865
c. THIS PAGE Unclassified					

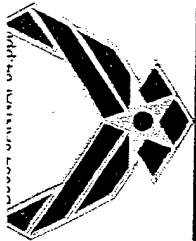
Monitoring Micro-Structural Evolution and Crack Formation in a Solid Propellant under Incremental Strain Condition- Using Digital Radiograph X- Ray Techniques



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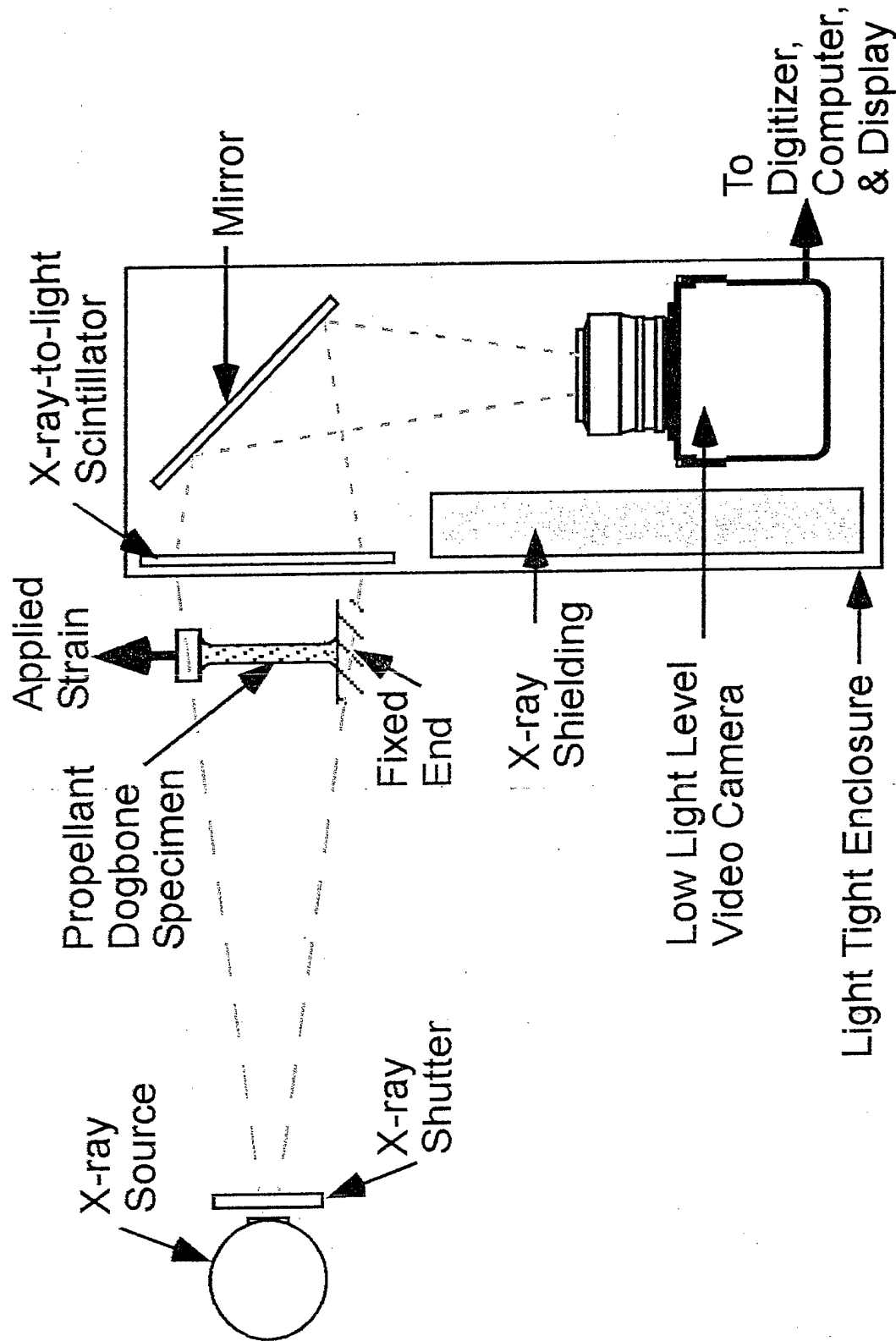


Objective

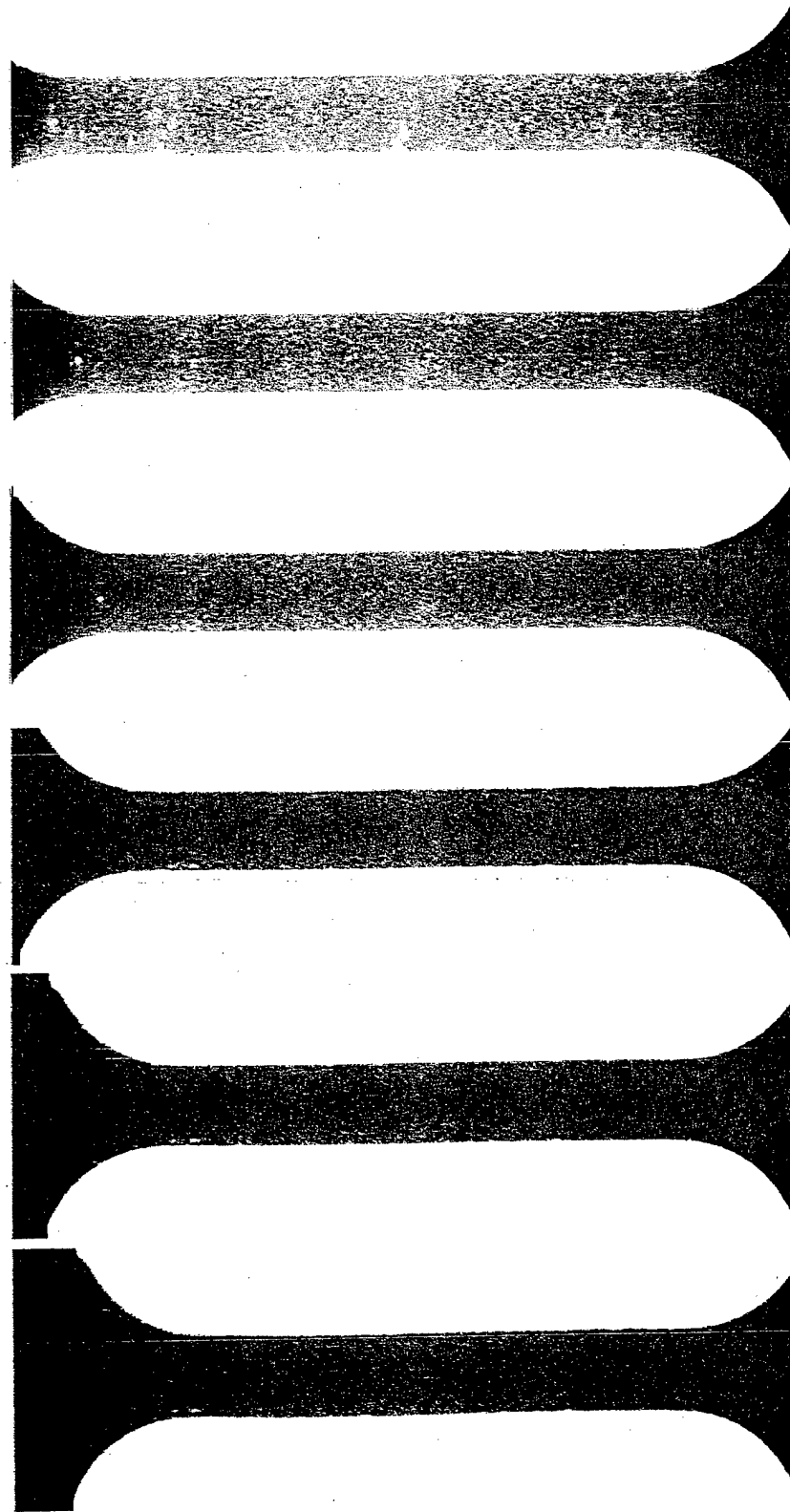


- Monitor Micro-Structure Evolution, Damage process, and Crack Formation in a Solid Propellant.

Testing Setup



X-Ray Images at Different Amounts of Stretch



0.0" stretch 0.1" stretch 0.2" stretch 0.3" stretch 0.4" stretch 0.5" stretch

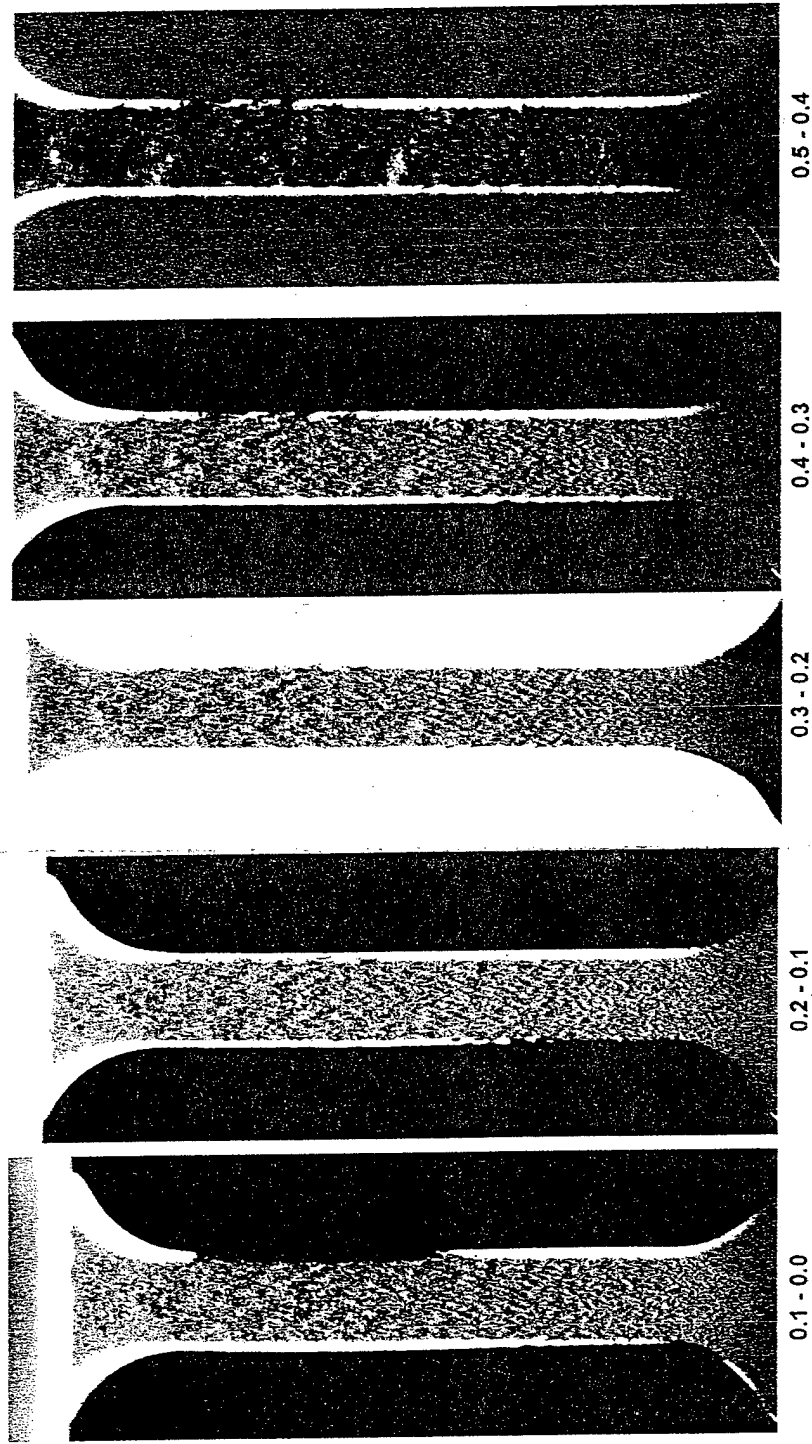
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Test Sample #3

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Difference X-Ray Images of the Change from One Stretch to the Next



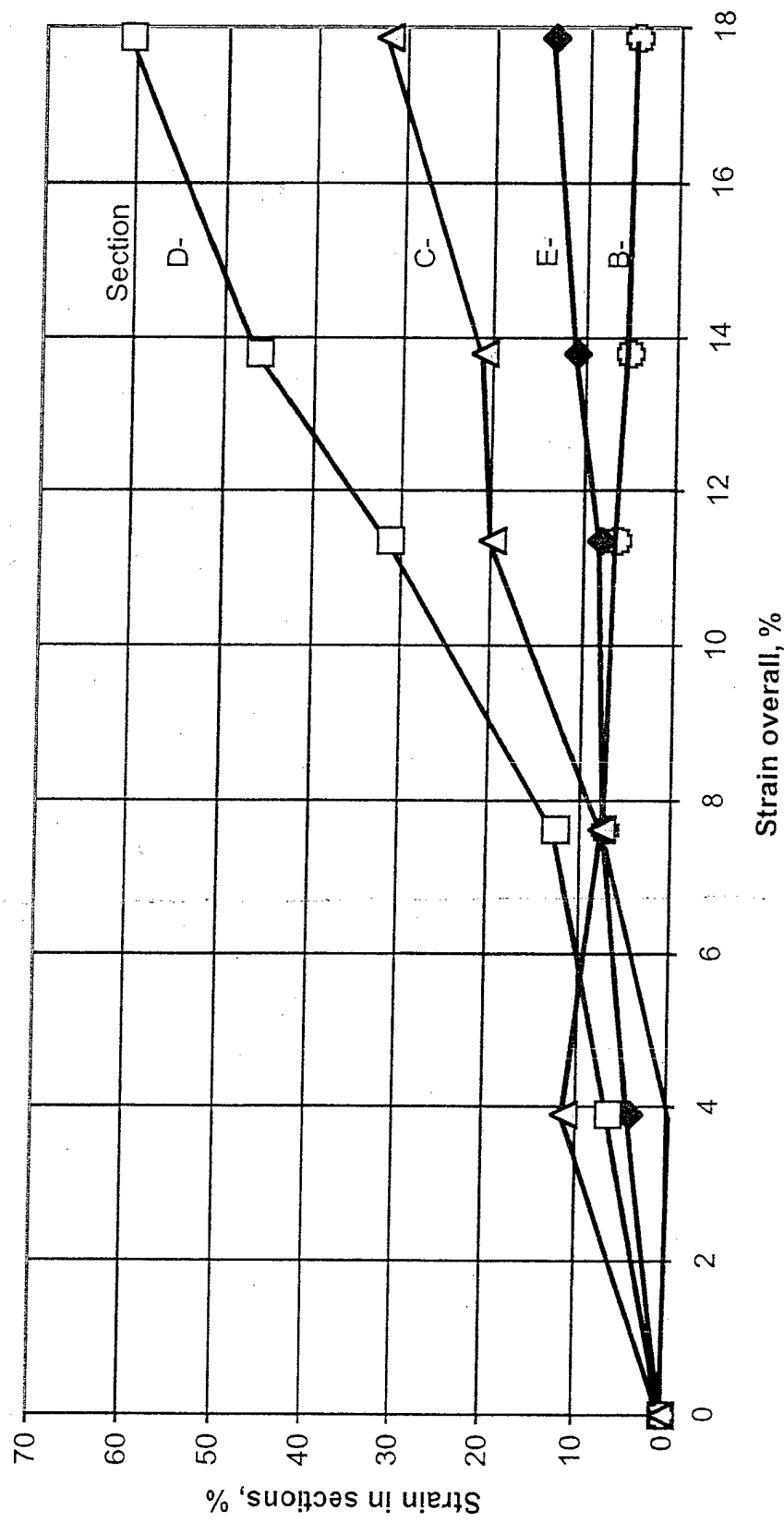
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Difference Images for Sample #3

Section Strain as a Function of Applied Strain



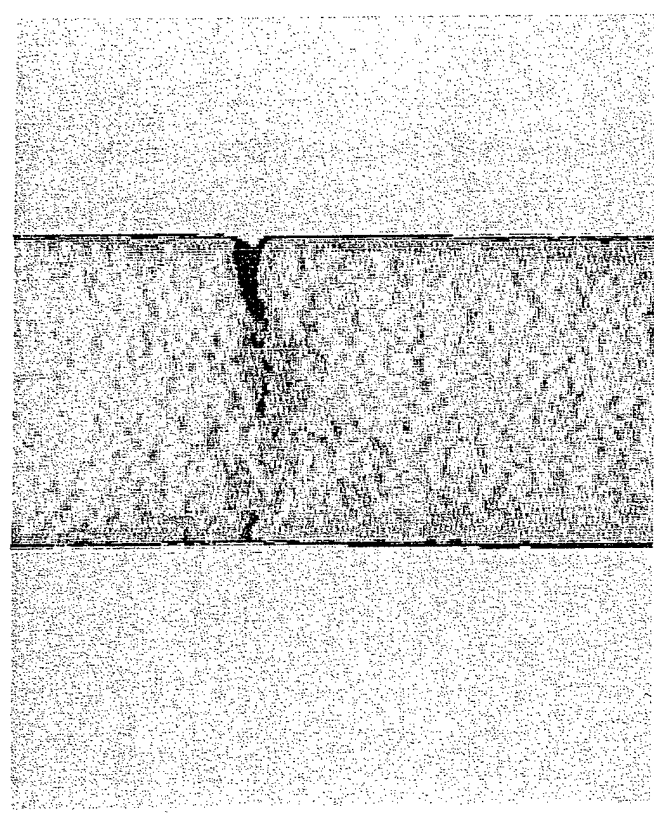
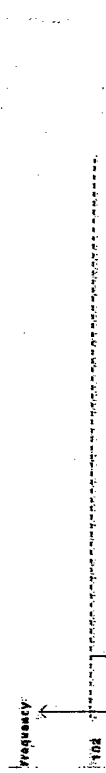
Strain plot for Uniaxial Tensile Test #3



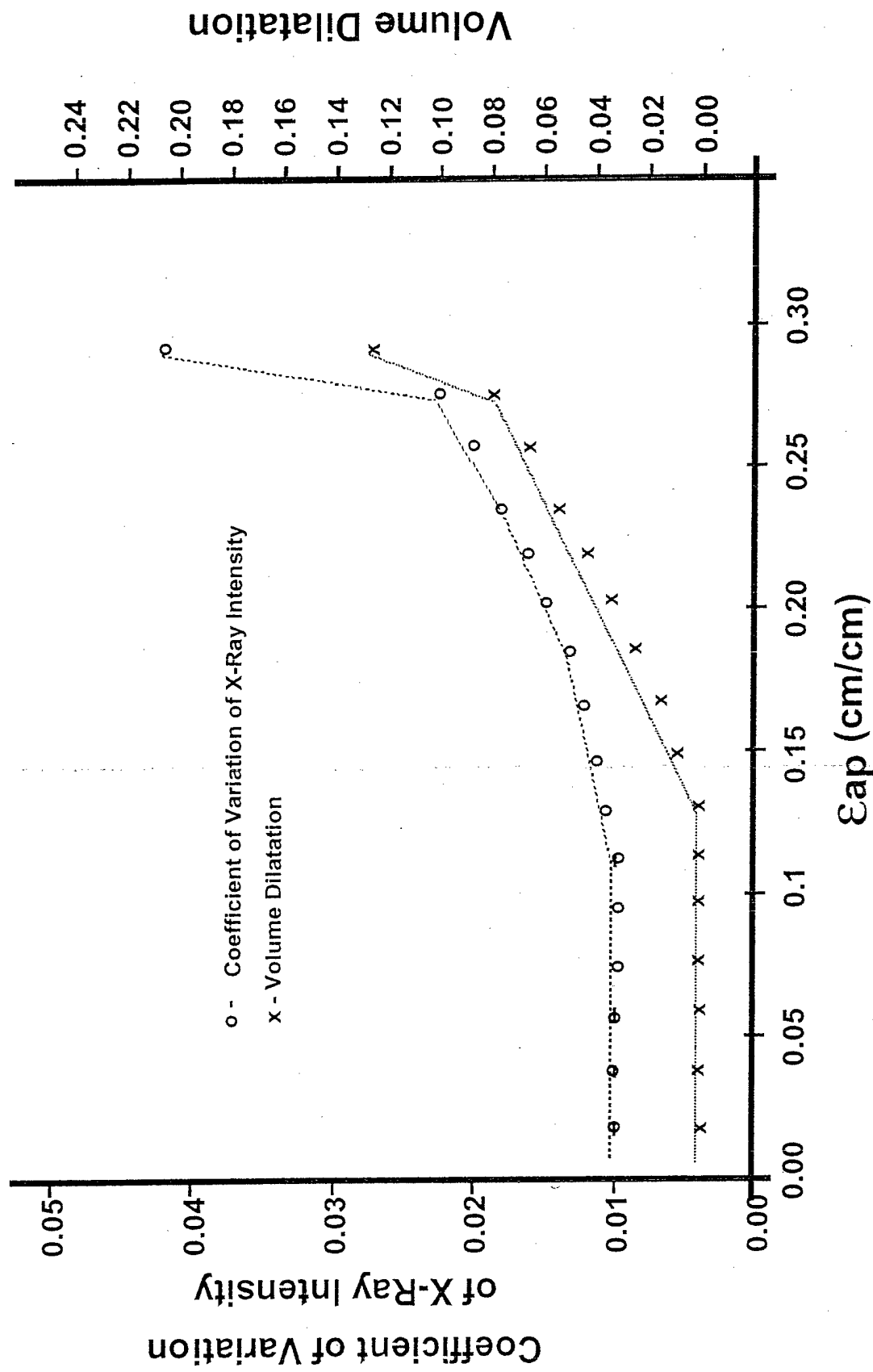


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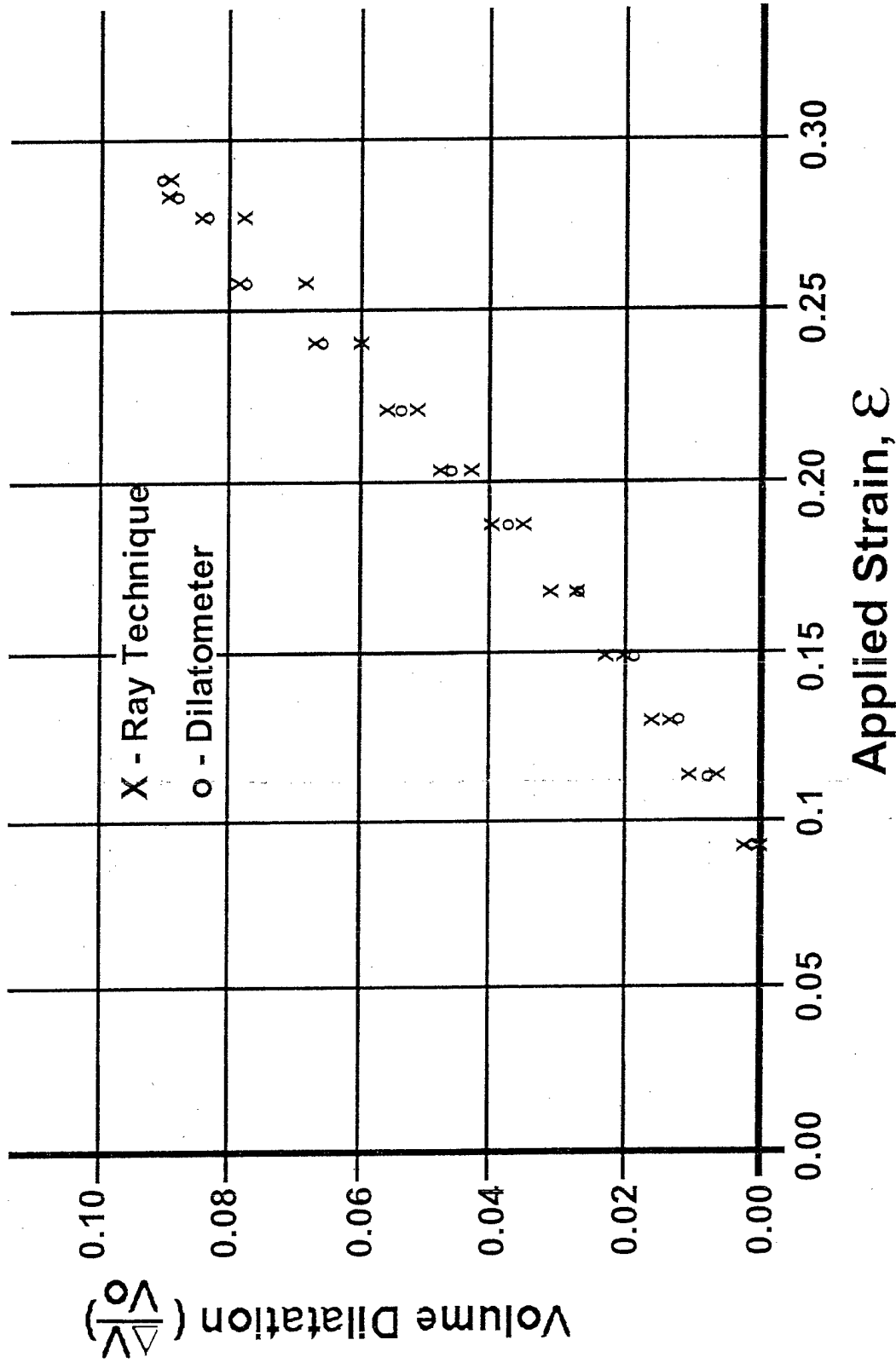
Histogram of X-Ray Intensity as Function of the Applied Strain at the Crack Location



Coefficient of Variation of X-Ray Intensity and Volume Dilatation as Functions of Applied Strain



Volume Dilatation as a Function of Applied Strain





Conclusions



- The degree of inhomogeneity of material's micro-structure and number of non-propagating cracks increase as the applied strain is increased.
- The rate of x-ray intensity increases very fast prior to the formation of a crack.
- At high applied strain levels, the strain distributions are highly non-uniform.
- A good correlation exists between the dilatations measured by x-ray technique and dilatometer.
- X-ray technique is a promising method to monitor micro-structure change and crack formation in solid propellants.